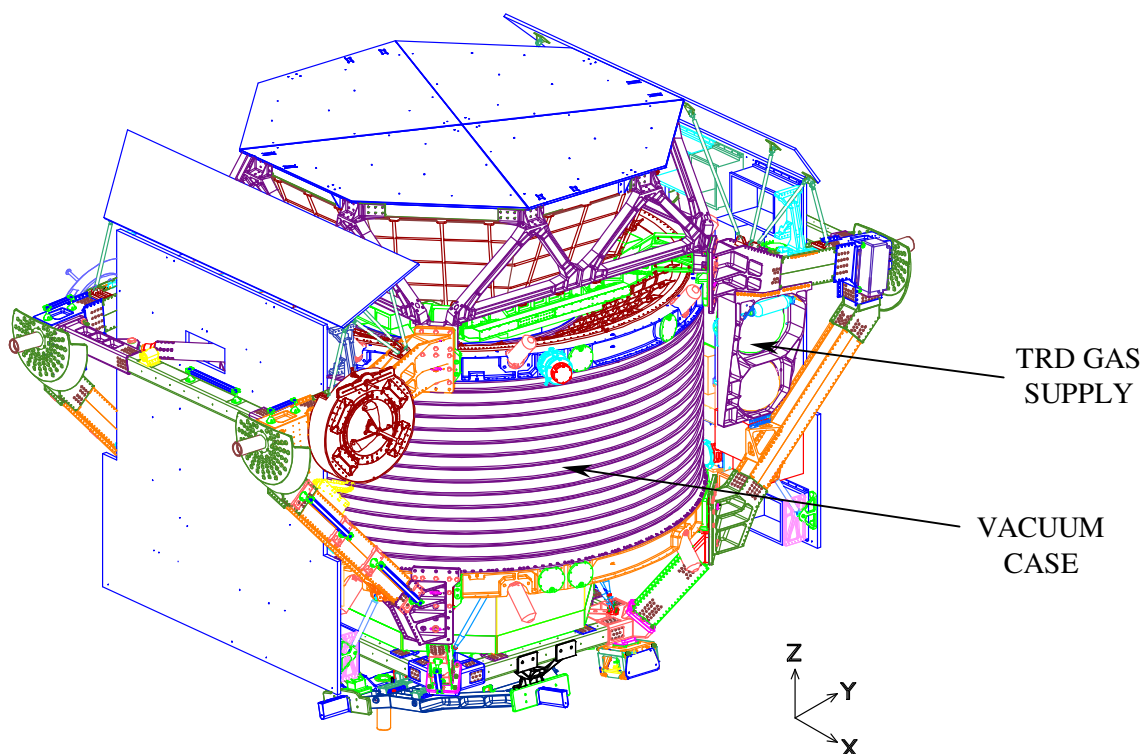
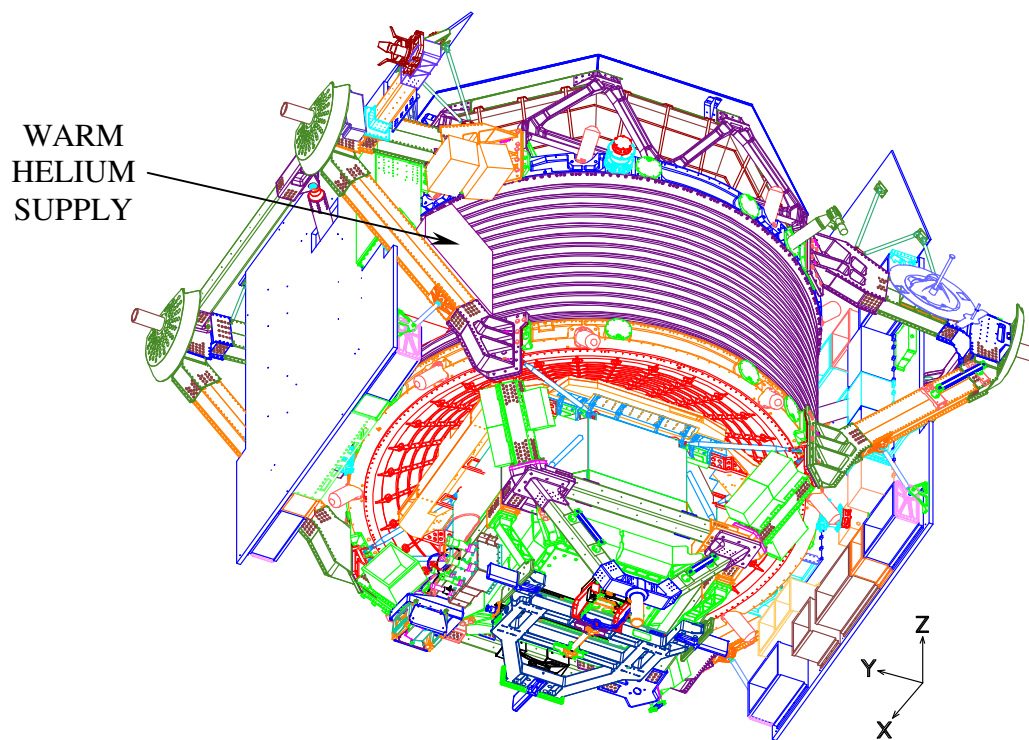


#### 5.14 MICROMETEOROID AND ORBITAL DEBRIS (MMOD) SHIELDING

The MMOD will be designed, analyzed, built and integrated by NASA/ESCG. The shielding is designed to protect the pressure systems on the AMS-02 experiment according to the environments specified in SSP 30425, paragraph 8.0. These systems include the Vacuum Case, Warm Helium Supply, and the TRD Gas System which contains both the Xe tank and CO<sub>2</sub> tank. The location of these components on AMS-02 is shown in figures 5.14-1 and 5.14-2.

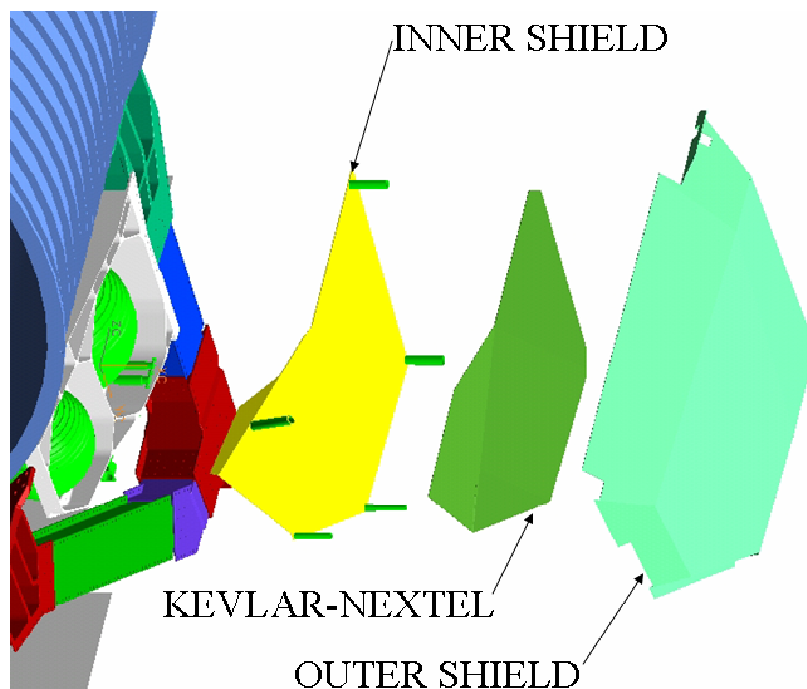


**Figure 5.14-1 AMS-02 Payload Assembly (1 of 2)**



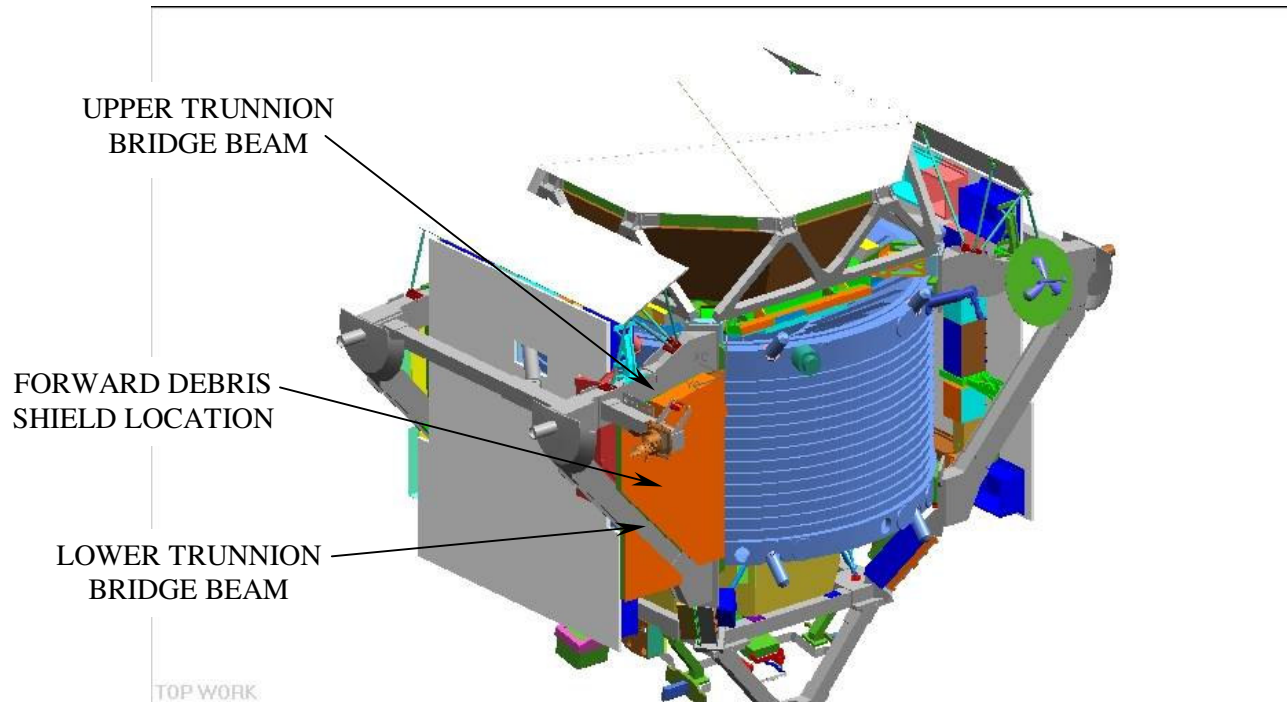
**Figure 5.14-2 AMS-02 Payload Assembly (2 of 2)**

The shielding will be made from various components in different locations depending on the required shield thickness, shape and size. The proposed MMOD shielding for AMS-02 consists of a 0.1 inch outer and inner aluminum sheet with a layer of 0.1 inch Kevlar/Nextel. Standoffs will be used to separate the outer aluminum sheet from the inner aluminum sheet. The proposed shield design is shown in figure 5.14-3. Both sets of MMOD shields will have the same general design.

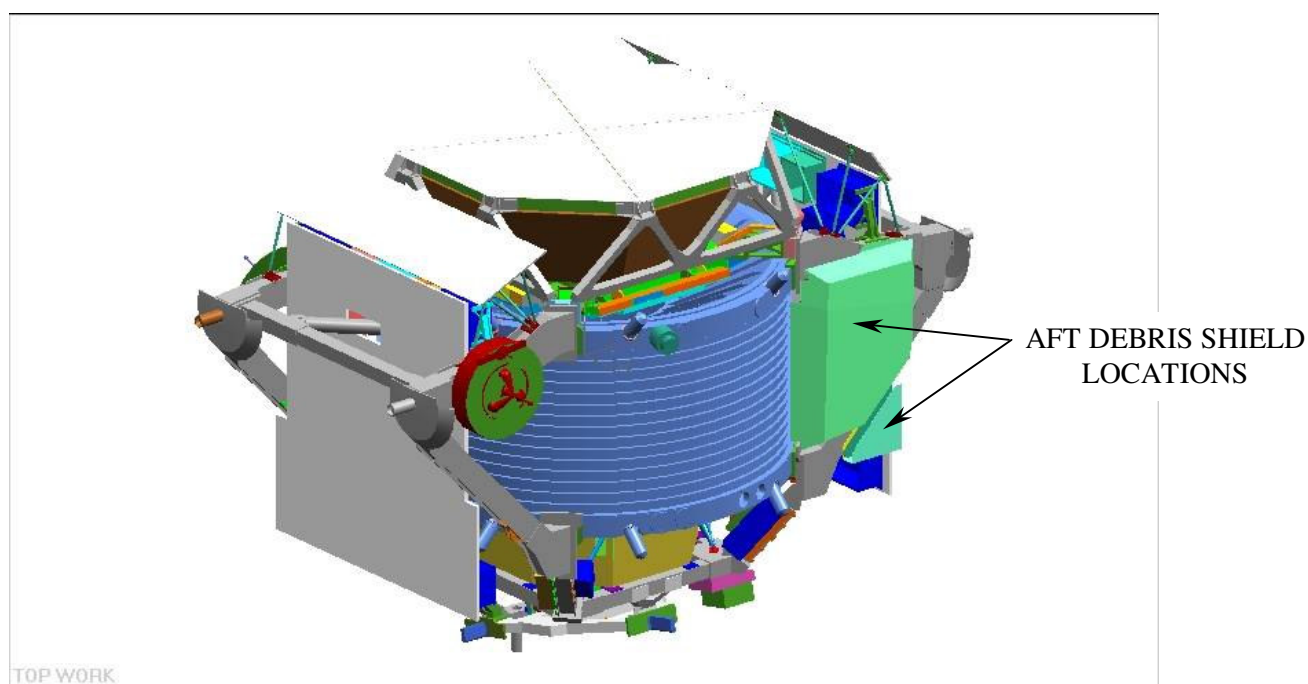


**Figure 5.14-3 Proposed MMOD Shield Design**

The shield assemblies will be bolted to the Upper and Lower Trunnion Bridge Beams of the USS-02. Proposed locations for the MMOD shielding are shown in figures 5.14-4 and 5.14-5.



**Figure 5.14-4 Warm Helium Supply Debris and Vacuum Case Debris Shield**



**Figure 5.14-5 TRD-Gas Supply and Vacuum Case Debris Shield**

The NASA Hypervelocity Impact Technology Facility has been and will continue to perform all of the analysis and testing for the MMOD requirements. Testing has been performed to ensure that the correct ballistic limit equations are used in the analysis. The shields will be designed to meet the ISS and STS requirements.

### 5.15 GLOBAL POSITIONING SYSTEM (GPS)

The AMS-02 utilizes an ALCATEL TOPSTAR 3000D which will be integrated into AMS by IN2P3-Montpellier. A single patch type antenna (Sextant Avionique model 3407-79) will be mounted on an upper USS-02 structural member. A signal from the GPS unit will be used for precision time correlation that exceeds the capabilities of the ISS to provide. The need for the GPS is to correct time drift over time within the precision timing systems that trigger the particle events.

Interface electronics within the M-Crate receive the precise time at which the timing pulse from the GPS unit was emitted and this is included, along with the value of the local timer, in the event data. To reach the required accuracy, software has been developed to include all the corrections required for low earth orbit GPS applications. The GPS operates off of the AMS-02 internal 28 VDC power bus.